Kentucky, January 25, states that "about 4 o'clock on the evening of the 23d, a heavy rumbling sound was heard, as if coming from a South-easterly direction, and from a point high in the heavens. The report was likened by some to the discharging of numbers of heavy ordnance, the different discharges barely distinguishable. The concussion was sufficient to rattle the glass in the windows, and also to jar the earth quite perceptibly. The course of the sound appeared to be from a point South South-east" of the writer's place of observation. The final explosion took place over Harrison County, Kentucky, and the ærolite reached the earth nine miles North of Cynthiana. It is now in the collection of Dr. J. Lawrence Smith, of Louisville.

The points from which this meteor was observed in Decatur and Monroe Counties are nearly on the same parallel; the latitude of the former being about 39° 27′, that of the latter 39° 21′. The distance between the stations is 56 miles, and the entire track, as seen from Decatur County, was East of the meridian. The observations in Monroe County indicate that the height of the meteor when first seen was at least 70 miles.

VIII.

The Meteor of February 8, 1877.

About half past 2 o'clock on Thursday morning, February 8th, 1877, a large meteor was seen by J. S. Hunter, Esq., near Ellettsville, Monroe County, Indiana. The apparent magnitude of the body seemed equal to half that of the full moon, and the sudden light was so intense as to frighten the horse of the observer. The meteor was first seen in the South-east, crossed the meridian South of the zenith, and disappeared at a point about 30° or 35° South of West, and 10° above the horizon. Numerous sparks were emitted by the body in the latter part of its track, and a luminous train remained visible several seconds. No explosion was heard.

Bloomington, Ind., *March* 7, 1877.

On the Asserted Antagonism between Nicotin and Strychnia.

By Francis L. Haynes, M. D., Assistant Surgeon to the Episcopal Hospital.

(*Read before the American Philosophical Society, March* 16, 1877.)

History.

Haughton's Experiments. The Rev. Prof. Haughton, in a communication read before the Royal Irish Academy, in Nov. 1856, was the first to call attention to the subject under consideration. He related the details of the following experiments on frogs: 1. A frog was placed in a bath composed of five ounces of water and five grains of nicotin. It died in twenty-three minutes. 2. A frog was placed in a bath of twenty ounces of water

and five grains of nicotin. It died in forty-three minutes, with peculiar convulsions. 3. A frog, placed in a solution of strychnia (five grains to five ounces of water), was immediately seized with tetanic convulsions, and died in four minutes. 4. A frog, placed in a solution of strychnia (five grains to twenty ounces of water), became speedily convulsed, and died in fifty-five minutes. 5. A frog, placed in a bath containing nicotin and strychnia (of each five grains to ten ounces of water), remained there nineteen minutes without any inconvenience, when it was seized with tetanic convulsions, which continued, but with less violence than in the previous experiments. After forty-seven minutes, the animal was removed, and washed in cold water. It lived afterwards more than twenty-four hours, exhibiting at intervals tetanic convulsions. 6. A frog was placed in a bath of nicotin and strychnia, as in the last experiment, and removed after ten minutes. In forty-two minutes, tetanic convulsions appeared, and continued for many hours, but they were succeeded by perfect recovery.

Wormley's Experiments. To each of thirteen cats, one-half grain of strychnia was given. "The poison was passed in solution into the stomach, by means of the stomach-tube. In some instances, as soon as symptoms of poisoning appeared, an infusion of twenty grains of tobacco leaves was administered, in the same manner as the poison; while, in others, the tobacco infusion was given along with the strychnia, the two infusions being thoroughly mixed. In some few cases, the dose of tobacco was repeated. As the result of these experiments, one of the animals, which had taken the mixed solutions, immediately fell prostrate, breathed with difficulty, in three minutes voided urine, in eight minutes vomited a frothy mucus, and in ten minutes was able to run, with, however, a stiff gait. After an hour, the animal appeared perfectly well, with the exception of a slight stiffness in walking. With this single exception, all the animals died, and, in most instances, within the usual period. One of them, however, that had taken the mixed solutions, manifested no symptom whatever, for thirty-five minutes. In some instances, the strychnine symptoms appeared to be not in the least affected by the tobacco. But, in others, they were of a compound nature. Several of the animals vomited. Before performing these experiments, it was ascertained that an infusion of twenty grains of tobacco, given alone, would produce serious symptoms; but, in no instance, in six experiments, did it cause death."—(*Micro-Chemistry of Poisons*, New York, 1865, p. 545.)

Reese's Experiments were made on dogs. The drugs were, as a rule, given by the mouth. 1. Three-fourths of a grain of strychnia, hypodermically, killed a moderate sized dog, in nine and one-half minutes. 2. Three-fourths of a grain of strychnia, and two drachms of a concentrated infusion of tobacco, were given by the mouth. Twenty-six minutes, tetanic spasms; thirty-one minutes, non-tetanic spasm; thirty-three minutes, somewhat tetanic spasm; thirty-nine minutes, one-half drachm of infusion of tobacco was given hypodermically, and was immediately followed by a tetanic spasm, and death. 3. Two drachms of tobacco infusion. Five minutes, free

vomiting; twenty minutes, quite well. Thirty minutes, three-fourths grain strychnia and two drachms tobacco infusion given; trembling, panting respiration. Forty three minutes, tetanic spasm; forty-five minutes, death. 4. Two drachms tobacco infusion; uneasiness, panting, vomiting, recovery. Twenty-five minutes, the dose was repeated; vomiting, trembling, panting. Fifty-one minutes, two drachms tobacco infusion with one-half grain strychnia; weakness, panting and trembling. Eighty-nine minutes, the combined dose of tobacco and strychnia repeated; noisy and panting respiration, increased reflex excitability, spasms sometimes tetanic and sometimes not. One hundred and nine minutes, died, without convulsion. 5. Half a drachm of tobacco infusion, hypodermically, repeated in five minutes; six minutes, retching and vomiting; fourteen minutes, strychnia, one third grain hypodermically; seventeen minutes, tetanic spasm; nineteen minutes, death.—(*Am. Jour. Med. Sci.*, April, 1871, p. 382.)

Cases of Strychnia Poisoning Treated by Tobacco.

O'Reilly's Case. A sailor took six grains of strychnia in beer. Soon after, he took an emetic, and vomited freely, but, notwithstanding, violent symptoms set in. One and a quarter hour after he had taken the strychnia, he was given an infusion of tobacco, and this was continued at intervals. After about twelve hours, all the symptoms had disappeared. It is not stated how the tobacco acted, but, merely, that in two hours after he had commenced taking tobacco, "favorable symptoms set in." In all, an infusion of one and a quarter ounce of tobacco was used. (*British and Foreign Medico-Chirurg. Rev.* Oct., 1859, p. 532.)

Smyly's Case. A boy, aged 15, swallowed as much strychnia as would cover a shilling, and ate a quantity of raisins to take away the taste. In forty minutes, he fell into his master's arms, tetanic. Tartar emetic was given, but it did not act. He was put under chloroform, and removed to a hospital. Emetics were given, but did not act. Next an infusion of three ounces of tobacco, in three pints of tepid water, was given, in three doses. Each dose was followed by furious vomiting. Profuse sweating occurred; the patient slept, and had no further trouble. (*Dublin Quart. Jour.* 1862, p. 183.)

Chever's Case. A Mohammedan girl, aged 11, took about three grains of strychnia, chewed it, spat out, as she thought, the whole of it, and then swallowed some water to remove the taste. In about forty minutes, a convulsion occurred. An emetic was given by the husband. She was taken to a hospital, three hours after taking the strychnia, and, up to that time, had had five convulsions. An emetic was given, and followed by large quantities of animal charcoal and lard, and small doses of infusion of tobacco. Two hours after admission, a severe convulsion occurred, lasting six minutes. Three hours after admission, there was free vomiting. Recovery ensued. She received in all, *two and one-third grains* of tobacco in infusion. It is stated that none of the emetics given acted satisfactorily, until the tobacco was given. (*British and Foreign Medico-Chirurg. Rev.* 1876, p. 242.)

Writer's Experiments.

The following experiments were made on rats, cats, rabbits, and dogs. The poisons were invariably injected under the skin.

The time given refers to the period of the injection of the poison ; or, if more injections than one were made, the time is dated from the first injection.

In all cases in which an animal was killed by strychnia, or nicotin, or by both combined, the heart continued to beat for a variable time after respiration had ceased.

A. *On Rats.*

The ordinary stable rats were used. First, the minimum fatal dose and the physiological action of nicotin were determined, and, next, the action of nicotin and strychnia combined.

I. *Minimum Fatal Dose of Strychnia Sulphate on Rats.*

This was found by J. Hughes Bennett (*Antagonism of Medicines*, London, 1875, p. 14) to be about ·1-60 of a grain of the pure alkaloid. The rats used by Bennett averaged about one ounce more in weight than those employed by the present writer. Of course the dose of the sulphate is proportionally larger.

II. *Minimum Fatal Dose and Physiological Action of Nicotin on Rats.*

When a small dose of nicotin (♏1-1000 to ♏1-600) is injected into a rat, its respiration becomes labored, and, sometimes, noisy ; and the animal shows signs of prostration, but is able to make voluntary motions. After larger doses (♏1-600 to ♏1-140), convulsions occur, which may be either clonic or tetanic. The convulsions may be preceded, and are always succeeded, by more or less complete paralysis of motion. One convulsion may terminate life, but, generally, the animal survives through several convulsions. The respiration, after each convulsion, ceases for several seconds, and, sometimes, for more than a minute. When death occurs, it is through failure of the respiration. The heart invariably continues to beat for a time after respiration has ceased. Purging and urination are frequent symptoms.

From the following experiments, the minimum fatal dose of nicotin, for rats, was found to be about 1-150 of a minim (taking the average weight to be about $10\frac{1}{4}$ ounces).

Table I.

Showing the Effects of Nicotin on Rats, and indicating the Minimum Lethal Dose.

No.	Weight of Rat.	Dose of Nicotin in parts of a Minim.	Result.	Symptoms.
1	10¼ oz.	1-1000	Recovery	Ran around the room actively for 5 minutes, then less actively till 10th *min.*; after which lay quiet unless disturbed, when it ran, but with difficulty. Respiration, after 5th *min.*, difficult—the walls of the chest exhibited a greater extent of motion than usual. Could be handled, without biting. 37 *min.*, recovering.
2	10¼ oz.	1-800	Recovery.	Immediately lay quiet and breathed laboriously, and after the 6th *min.* noisily. At intervals, slight convulsive movements. At no time was there inability to move when disturbed. 13 *min.*, recovering.
3	6¼ oz.	1-700	Recovery.	After ½ *min.*, lay quietly, breathing laboriously. 1 *min.*, can barely move when disturbed. Respiration noisy, and slower than normal. 8½ *min.*, respiration gasping, 58 a minute. 22 *min.*, respiration still labored, 80; moves more readily.
4	10¼ oz.	1-666	Recovery.	Panting respiration, and semi-paralysis. Recovery after 30 *min.*
5	10¼ oz.	1-600	Recovery.	Same as in last experiment.
6	8 oz.	1-600	Death.	After 15 *sec.*, hissing and laborious respiration; moved rapidly around the cage till 10 *sec.*; then lay, gasping for breath, till 60 *sec.*, when tetanoid convulsions occurred, which caused respiration to cease at the end of the 2d *min.*
7	11 oz.	1-550	Recovery.	½ *min.*, difficult respiration. 1 *min.*, paralysis. 2½ *min.*, clonic convulsions with opisthotonos, which continued at intervals till 8*th min.*, when they ceased, and the respiration became gasping and infrequent, 10 per minute; and there was complete motor paralysis. 12 *min.*, respiration re-established, hissing. 35 *min.*, slight voluntary movements. 60 *min.*, almost constant convulsive trembling, with laborious and occasionally noisy respiration. 2 *hrs.* condition the same. Very slight movements occasionally.
8	6½ oz.	1-500	Recovery.	Same as in last experiment.
9	8¼ oz.	1-440	Recovery.	Immediately difficult respiration. ½ *min.*, violent tetanic convulsions, succeeded by panting noisy respiration, and complete motor paralysis. Very rapid muscular quiverings, causing such rapid movements of one foreleg that they could scarcely be seen. 19 *min.*, recovering voluntary power.
10	10¼ oz.	1-400	Recovery.	Usual symptoms. Convulsions clonic and tonic.
11	10 oz.	1-300	Recovery.	Usual symptoms. Convulsions clonic.
12	10 oz.	1-230	Recovery.	Difficult respiration, slight clonic convulsions, and semi-paralysis.
13	11¼ oz.	1-230	Recovery.	Difficult respiration, no convulsions, semi-paralysis.
14	10¼ oz.	1-230	Recovery.	Same as in last experiment.
15	8 oz.	1-230	Recovery.	Difficult respiration. 3½ *min.*, violent tetanic convulsions, after which respiration ceased for 15 sec., then recommenced with a gasp. There was semi-paralysis for a few minutes, but by 18 *min.* the animal had almost recovered.
16	4½ oz.	1-200	Death.	Immediately clonic convulsions, which ended fatally in ½ *min.*
17	10¼ oz.	1-191	Death.	Ran around the room for ½ *min.*, when he stopped, and the respiration was noted noisy and laborious. 2 *min.*, complete motor paralysis. 3½ *min.*, violent clonic convulsions lasting till 4¼ *min.* Respiration now ceased till 5½ *min.*, recommenced with a gasp, and ceased finally at 6 *min.*

TABLE I.—CONTINUED.

No.	Weight of Rat.	Dose of Nicotin in parts of a Minim.	Result.	SYMPTOMS.
18	7¾ oz.	1-176	Death.	1½ *min.*, convulsions, succeeded by difficult respiration and semi-paralysis. 25 *min.*, complete paralysis. 2¼ *hrs.*, moves limbs slightly when disturbed. Death at 3 *hrs.*, the respiration falling gradually down to 6, then to 1, per minute.
19	10⅛ oz.	1-176	Recovery.	1 *min.*, labored respiration. 4 *min.*, prolonged tetanic convulsion, followed by the usual respiratory difficulty and semi-paralysis. 60 *min.* recovery.
20	9¼ oz.	1-143	Death.	½ *min.*, noisy, labored respiration; convulsions, lasting 3 min., then almost complete paralysis. 53 *min.*, convulsions excited by slight irritation, semi-paralysis till 144 min., when slight voluntary motions were noted. 20 *hrs.*, respiration feeble, 30; lay powerless on the side, and had tetanic and clonic convulsions when disturbed. 20½ *hrs.*, heart beats, 93; respiration, 15. Entire paralysis. 23 *hrs.*, death from failure of respiration, which had occurred once a minute for some time previously.
21	7¾ oz.	1-143	Death.	Same as in last experiment. Death after 5 *hrs.*

III. *Effects of Nicotin and Strychnia Sulphate, when Injected Simultaneously.*

First, the drugs were injected in less than fatal doses; next, fatal doses were employed.

TABLE II.

Strychnia Sulphate and Nicotin, injected simultaneously, in Non-fatal Doses.

No.	Weight of Rat.	Dose of Strychn. Sulph. in parts of a grain.	Dose of Nicotin in parts of a Minim.	RESULTS.	Result of Crucial Experiment performed Nine Days afterwards.
22	9¾ oz.	1-96	1-1000	Ran around the room actively for 4 *min.*, then kept quiet, unless disturbed, for ½ *hr.* During this time, the respiration was panting.	Strychnia Sulphate gr. 1-96, alone, produced no effect. For the effect of ♏ 1-1000 Nicotin see Experiment 1.
23	8⅛ oz.	1-96	1-800	After 1 *min.*, difficult respiration and prostration. 8 *min.*, almost complete paralysis, convulsive motions occasionally. Increased reflex excitability. 27 *min.*, recovering.	Strychnia Sulphate, gr. 1-96, alone, produced a slight increase of reflex excitability. For effects of Nicotin, ♏ 1-800, see Experiments 1, 2, and 3.
24	10¼ oz.	1-64	1-800	Difficult respiration, increased reflex excitability, and indisposition to move.	Strychnia Sulphate, gr. 1-64, produced slight increase of reflex excitability.
25	10¼ oz.	1-96	1-666	Very difficult respiration, and semi-paralysis. The animal had scarcely begun to recover at the end of 45 *min.*	Nicotin, ♏ 1-666, produced difficulty of respiration and semi-paralysis lasting 30 *min.*

TABLE II.—CONTINUED.

No.	Weight of Rat.	Dose of Strychn. Sulph. in parts of a grain.	Dose of Nicotin in parts of a Minim.	RESULTS.	*Result of Crucial Experiment performed Nine Days afterwards.*
26	11 oz.	1-96	1-400	Immediately, difficult respiration and almost complete paralysis; then convulsive trembling. At 11 *min.*, violent convulsions, after which there was semi-paralysis, with very difficult respiration.	Nicotin, ♏ 1-400, produced difficult respiration, semi-paralysis, and convulsions.
27	8 oz.	1-96	1-230	½ *min.*, panting respiration, and almost complete paralysis. 2½ *min.*, convulsions, which recurred every few seconds till the 5th *min.* They were sometimes clonic, and sometimes tonic. The animal lay quiet till the 11th *min.*, when there was another convulsion. 13 *min.*, convulsion, marked reflex excitability. 65 *min.*, slight convulsion.	Nicotin, ♏ 1-230, was followed by difficult respiration and powerful tetanic convulsions. At 18 *min.*, entire recovery.
28	11¼ oz.	1-96	1-230	1 *min.*, panting respiration, semi-paralysis. 1½ *min.*, violent convulsions, after which respiration temporarily ceased, then recommenced with a gasp. Prolonged exhaustion.	Nicotin, ♏ 1-230, caused difficult respiration and semi-paralysis, but no convulsions.
29	10¼ oz.	1-96	1-230	Same as in Experiment 23.	Nicotin, ♏ 1-230, produced same effects as in Experiment 28.
30	10¼ oz.	1-96	1-176	1 *min.*, irregular convulsions, followed by difficult respiration and prostration. 35 *min.*, severe irregular convulsions, followed by marked increase of reflex excitability. 75 *min.*, marked tetanic convulsion. 2¼ *hrs.*, there have been occasional convulsive movements, but at no time paralysis.	Nicotin, ♏ 1-176, had been given alone 1 week previously. It had caused severe convulsions, but the animal had recovered in 1 *hr.*

The effects of fatal doses of Strychnia Sulphate, injected with, or followed by, varying doses of Nicotin; and of fatal doses of Nicotin, injected with, or followed by, varying doses of Strychnia Sulphate, were next noted. The results are given in the following table. It will be noticed, that in some cases either drug was given in divided doses, and that, in these cases, the total amounts given are mentioned in the appropriate column.

Table III.

Experiments in which Nicotin and Strychnia Sulphate were given together, or at short intervals, Fatal or nearly Fatal Doses of either Drug being employed.

No.	*Weight of Rat.*	*Dose of Strychn. Sulph. in parts of a grain.*	*Dose of Nicotin in parts of a Minim.*	*Result.*	Symptoms, &c.
31	8 oz.	1-48	1-2000	Death.	After 1 *min.* the animal stood quiet, breathing with great difficulty. Occasional convulsive jerks were noted, and at 20 *min.* a tetanic convulsion (with emprosthotonos) and death.
32	8⅛ oz.	1-48	1-1000	Death.	The animal stood quietly, breathing somewhat heavily, until 30 *min.*, when there was a tetanic spasm, and death.
33	5 oz.	1-44	1-1000	Death.	After 3 *min.*, difficult respiration, and marked reflex excitability. 5 *min.*, slight convulsion, after which the respiration was slow and difficult, and the animal walked with great difficulty, and only when irritated. 15 and 27 *min.*, slight convulsions. 42 *min.*, tetanic convulsion, and death.
34	9½ oz.	1-48	1-800	Death.	1 *min.*, panting respiration. 5 *min.*, increased reflex excitability; prostration. 25 *min.*, tetanic convulsion, and death.
35	9½ oz.	1-31	1-800	Death.	The animal immediately lay on side paralyzed, and continued so till death, which followed an irregular convulsion at 2 *min.* The respiration was slow and gasping throughout.
36	6⅞ oz.	1-48	1-500	Death.	The nicotin was given in divided doses. ♏ 1-1000 was given with the Strychnia Sulphate. The rat stood quietly, breathing heavily until 12 *min.*, when there was convulsive trembling. An attempt to use the hypodermic syringe caused a convulsion. Nicotin, ♏ 1-2000, was now injected. At 20 *min.*, a second tetanic convulsion occurred, and immediately after Nicotin, ♏ 1-2000 was injected. At 22 *min.*, tetanic convulsion, and death.
37	5⅝ oz.	1-48	1-500	Death.	Immediately, almost complete paralysis, and panting respiration. From 1½ to 4 *min.*, continuous opisthotonos, with exceedingly rapid vibrations of the extremities. The respiration became slower and slower; at times, intervals of 10 sec. passed between the respiratory acts. 4 *min.*, slight convulsive motions. 7 *min.*, slight voluntary motions. Increased reflex excitability. Convulsions at 22, 34, and 37 *min.*, then death.
38	9¼ oz.	1-48	1-500	Death.	Nicotin given in divided doses, as detailed below. 5 *min.* after injection of Strychnia Sulphate, no effect was apparent, except increased reflex excitability. Nicotin, ♏ 1-1000, was injected. 10 *min.*, the rat is inactive; respiration somewhat labored. Increased reflex excitability. Nicotin, ♏ 1-1000, was injected. The respiration immediately became more difficult; the animal staggered, fell on side, and, at 13½ *min.*, had a violent tetanic spasm (emprosthotonos), terminating in death.
39	6⅞ oz.	1-48	1-800	Death.	The animal stood quietly, breathing heavily. 5 *min.*, almost helpless; marked reflex excitability. 13½ *min.*, tetanic spasm, and death.
40	9¾ oz.	1-48	1-400	Death.	Difficult respiration, increased reflex excitability, and almost complete paralysis, till 22 *min.*, when there was a single tetanic spasm, and death.
41	10¼ oz.	1-48	1-600	Death.	½ *min.*, difficult respiration; stands motionless, or moves with difficulty, if disturbed. 15 to 18 *min.*, slight convulsions. 25 *min.*, tetanic convulsion, and death.

TABLE III.—CONTINUED.

No.	Weight of Rat.	Dose of Strychn. Sulph. in parts of a grain.	Dose of Nicotin in parts of a Minim.	Result.	SYMPTOMS, &c.
42	10 oz.	1-96	1-220	Death.	The Nicotin was first injected; immediately after, difficult respiration, and semi-paralysis. 6 *min.*, irregular convulsions which terminated in cessation of respiration for 15 sec., when it re-commenced with a gasp. There was now complete paralysis (excepting of course the heart and respiration). At 25 *min.*, the animal was beginning to recover power, when Strychnia Sulphate, gr. 1-96, was injected. 43 *min.*, increased reflex excitability. 50 *min.*, tetanic convulsion, and death. *Post mortem*—The heart was exposed; it continued to beat for 10 min.
43	7⅛ oz.	1-96	1-200	Death	Immediately, violent convulsions, lasting one min., followed by temporary cessation of respiration, which recommenced with a gasp. Almost complete paralysis till 23 *min.*, when the convulsions recurred, and terminated in death.
44	6 oz.	1-192	1-200	Death.	The Nicotin was first injected; it was followed in ½ *min.* by a tetanic convulsion, lasting 2 *min.*; then semi-paralysis. 4 *min.*, Strychnia Sulphate, gr. 1-192, was injected. 10 *min.*, the semi-paralyzed condition continued. Reflex excitability increased. 14 *min.*, tetanic, alternating with clonic, convulsions commenced, and lasted for 8 min., after which there was almost complete paralysis 33 *min.*, tetanic convulsion, and death.
45	8½ oz.	1-96	1-130	Death.	Convulsions for 5 *min.*, succeeded by semi-paralysis, and increased, reflex excitability, with extreme difficulty in respiration. 2 *hrs.*, slight voluntary motions. 20 *hrs.*, almost complete paralysis; no convulsions. 21 *hrs.*, complete paralysis; slight convulsive movements occasionally. 23 *hrs.*, death from failure of respiration, which had become very infrequent (one a minute).
46	9½ oz.	1-96	1-125	Death.	1 *min.*, tetanic convulsion, lasting 2 *min.*, and followed by semi-paralysis and difficult respiration. 28 *min.*, tetanic convulsion, and death.

B. *On Cats.*

As in the preceding series of experiments, the minimum fatal dose and the physiological effects of the two poisons were first ascertained.

I. *Minimum Fatal Dose of Strychnia Sulphate on Cats.*

This was found to be about 1-425 of a grain to the pound. It is probable, however, that age and individual peculiarities produce variations in the effects of this and other poisons.

TABLE IV.

Indicating the Minimum Fatal Dose and Physiological Effects of Strychnia Sulphate on Cats.

No.	Weight.	Dose of Strychnia Sulphate in parts of a grain.	Result.	SYMPTOMS.
47	7¼ lb.	1-16	Death.	A single convulsion caused death in 5 *min.*
48	1¼ lb.	1-30	Death.	A single convulsion caused death in 5 *min.*
49	3¼ lb.	1-30	Death.	In 13 *min.*
50	5¾ lb.	1-60	Death.	In 75 *min.*
51	5 lb. 15½ oz.	1-96	Recovery.	After 22 *min.*, panting, labored respiration. Great reflex excitability; slight convulsions, when disturbed; when not disturbed, sat motionless. After 1 *hour*, recovered.
52	3 lb.	1-144	Recovery.	In 15 *min.* extremely violent convulsions, lasting 2 *min.* Then the animal lay motionless on its side for 10 *min.*, and then was able to move, but with great difficulty. Convulsions occured at 47, 67, and 85 *min.*
53	2 lb. 14 oz.	1-192	Death.	After 15 *min.* a single tetanic convulsion, and death.
54	2 lb. 1 oz.	1-210	Recovery.	Marked reflex excitability and difficult locomotion.
55	2 lb. 1 oz.	1-240	Recovery.	No effect.
56	1 lb. 13 oz.	1-280	Recovery.	Marked reflex excitability; locomotion almost impossible for 1 hour.
57	1¼ lb.	1-280	Death.	In 19 *min.*
58	1 lb. 14 oz.	1-280	Recovery.	Barely escaped with life, after several severe convulsions.
59	1½ lb.	1-300	Death.	In 25 *min.*
60	1½ lb.	1-330	Recovery.	Barely escaped with life, after severe convulsions.
61	1 lb. 11 oz.	1-373	Recovery.	Slight rigidity of extremities, lasting 1 hour.
62	1 lb. 14 oz.	1-560	Recovery.	Slight rigidity of extremities.
63	½ lb.	1-400	Death.	After several hours.
64	2 lb. 3½ oz.	1-200	Death.	After two convulsions, in 30 *min.*

II. *Minimum Fatal Dose and Physiological Action of Nicotin on Cats.*

The least fatal dose was found to be about 1-150 of a minim to the pound. The physiological effects do not materially differ from those observed in rats. An additional symptom is extremely violent vomiting, due to gastro-intestinal spasm. (*Nasse.*)

TABLE V.

Showing the Effects of Nicotin on Cats, and the Minimum Lethal Dose.

No.	Weight of Cat.	Dose of Nicotin in parts of a Minim.	Result.	SYMPTOMS.
65	5 lb. 15 oz.	1-30	Recovery.	Respiration slow and labored for ½ *min.*, then rapid and panting. Twitching of the ears. Disinclination to move. 45 *min.*, recovering.
66	8 lb.	1-20	Recovery.	The animal moved rapidly around the room for 9 *min.* Then vomiting occurred, and was followed by violent retching. He uttered incessant cries, and walked around, but less actively. The respiration was slow and panting; the pupils contracted. 20 *min.*, he walks with difficulty, having imperfect control over the posterior extremities. 1 *hour*, recovering.
67	8 lb.	1-19	Recovery.	Before the injection, the pulse was 150, and the respiration 51, a minute; the pupils were 9-20 in. in diameter. 2 *min.*, walks with great difficulty. Cries out anxiously. Purging and salivation. Respiration 45, noisy and difficult. Pupils 8-20. 8 *min.*, lay stretched out on side. Respiration 150. Pupils 7-20; nictitating membrane drawn over eye. 12 *min.*, walks with great difficulty, when disturbed. Respiration extremely rapid and panting. 27 *min.*, moves head, when tail is pinched, but cannot move rest of body. 37 *min.*, convulsive twitching of ears. 45 *min.*, paralysis and complete unconsciousness. Respiration 84. Pupils 10-20. 123 *min.*, recovering.
68	8 lb.	1-18	Death.	Before the experiment, respiration 36; pulse 156; pupils 10-20. 1 *min.*, respiration 30, very labored. 2½ *min.*, respiration 66, whistling; cried out; ears twitched; salivation. 4 *min.*, respiration 144; pupils 4-20; violent retching, purging. The animal lay apparently powerless, but moved, though with great difficulty, when disturbed; the extremities were quite rigid. No convulsive movements were apparent, except in the ears, but all the muscles (especially the masseters) could be felt rapidly vibrating. 12 *min.*, entire paralysis; legs jerked. 13 *min.*, respiration 63, noiseless; slight clonic convulsion. The respiration now became more and more infrequent, and finally ceased at 15 *min.* The heart beat five minutes longer. The pupil just before death was 8-20.
69	5 lb. 6 oz.	1-30	Death.	Before the experiment, the respiration was 57, the pupil 9-20. 1 *min.*, respiration 120, panting. 2 *min.*, lay on side; ears twitched; violent retching. 7 *min.*, respiration 45, not noisy, but very laborious; pupils 8-20. 11 *min.*, walked a few paces, with great difficulty. 12 *min.*, irregular convulsions, lasting ½ minute, and ending in death, through failure of respiration. The heart continued to beat for a few minutes.
70	3 lb.	1-60	Death.	Difficult respiration; vomiting, purging, and urination; tetanic convulsions, and death at 7 *min.*
71	3 lb. 9 oz.	1-35	Death.	Immediately on termination of injection, tetanic convulsions set in, and lasted for 1 minute, when the respiration ceased.

III. *Effects of the Combined Action of Nicotin and Strychnia Sulphate on Cats.*

Experiment 72.

Strychnia Sulph. gr. 1-292 and Nicotin ℳ1-40 were injected together into a cat, weighing 1 lb. 14½ oz. The animal immediately breathed noisily and with difficulty; the ears twitched rapidly. He walked around the room with great difficulty, and at 4 *minutes* fell over on the side convulsed, and shortly expired. The heart continued to beat for a time after respiration had ceased, and this was the case in all the subsequent experiments.

Experiment 73.

Strychnia Sulph. gr. 1-192 and Nicotin ℳ1-20 were injected together into a cat, weighing 2 lbs. 5 oz. The symptoms were: rapid, noisy, labored respiration; violent retching, and purging; in 2 *minutes*, tetanic convulsion, and in 4 *min.* death. Convulsive movements of the muscles of the head continued for several minutes after death.

Experiment 74.

Strychnia Sulph. gr. 1-288 and Nicotin ℳ1-70 were injected together into a cat, weighing 2 lbs. ½ oz. The symptoms were the same as in the preceding experiment. Death occurred at 5½ minutes.

Experiment 75.

Strychnia Sulph. gr. 1-130 and Nicotin ℳ1-75 were injected together into a cat, weighing 3 lbs. 9 oz. ½ *min.*, the cat walked around the room, staggering; extremities stiff; respiration slow and panting. 3 *min.*, he lay motionless on the side, but was able to move slightly, if irritated. There was marked reflex excitability. The respiration was rapid and difficult. 6 *min.*, slight, momentary, clonic convulsion. The respiration now became more and more feeble and infrequent, and ceased at 12 *minutes*.

Experiment 76.

Strychnia Sulph. gr. 1-74 and Nicotin ℳ1-40 were injected together into a cat, weighing 6½ lbs. 3 *min.*, he ran around, crying anxiously. The respiration was slow, panting, and labored. 4 *min.*, he lay over on the side occasionally, as if exhausted. Convulsive twitching of the ears, and violent vomiting and retching, now commenced. The membrana nictitans was drawn. 5½ *min.*, he lay stretched out, motionless, on the side, but could walk, though with great difficulty, when disturbed. 9 *min.*, clonic, succeeded by tetanic, convulsions set in, and caused death.

Experiment 77.

Strychnia Sulph. gr. 1-74 and Nicotin ℳ1-30 were injected together into a cat, weighing 6 lbs. 6 oz. The usual difficulty of breathing, vomiting, and prostration, ensued. The pupil was contracted. At 6½ *min.*, feeble convulsions occurred, lasted ½ minute, and were succeeded by complete paralysis. Respiration ceased at 9 *minutes*.

Experiment 78.

Strychnia Sulph. gr. 1-96 and Nicotin ♏ 1-63 were injected together into a cat, weighing 5 lbs. 3 oz. After 5 *min.*, twitching of ears; panting, rapid, labored respiration; contracted pupils. These symptoms, together with violent vomiting, continued till 15 minutes: when, in addition, marked reflex excitability was noted. 17 *min.*, convulsive jerking, which continued at intervals until 37 *min.*, when a violent tetanic convulsion occurred, and killed the animal. The symptoms, up to 15 *min.*, were those peculiar to Nicotin; then the convulsive action of Strychnia showed itself, increased, probably, by the identical action of Nicotin. At no time was there paralysis: the dose of Nicotin was not large enough to produce this symptom.

Experiments 79, 80, 81.

(79) A cat weighing 2 lbs. 3 oz. received Strychnia Sulph. gr. 1-288. No symptoms resulted.

(80) The same animal, one week afterwards, received Nicotin ♏ 1-86. The symptoms lasted about one hour, and were as follows: violent vomiting, staggering gait, contracted pupils, twitching of the ears, and rapid, noisy respiration.

(81) The same animal, one week afterwards, received, by a single injection, Strychnia Sulph. gr. 1-288 and Nicotin ♏ 1-86. The respiration immediately became rapid and labored. In 30 *seconds* clonic convulsions commenced, and lasted till death, which occurred at 2 *minutes*.

Experiments 82, 83.

(82) A kitten, weighing 1 lb. 12 oz., received Strychnia Sulph. gr. 1-384. 27 *min.*, a tetanic spasm occurred, and lasted one minute. The animal then lay perfectly motionless, with panting respiration, for 5 minutes; and afterwards rapidly recovered.

(83) The same kitten, one week afterwards, weighing 1 lb. 14½ oz., received Strychnia Sulph. gr. 1-384, together with Nicotin ♏ 1-100. After 1 *min.*, the animal breathed laboriously, and walked with difficulty. 2 *min.*, twitching of ears, violent vomiting. 3 *min.*, respiration very labored and noisy. Limbs very stiff. Vomiting continues. 15 *min.*, convulsions, somewhat tetanic; death at 17 *min.*

Experiments 84, 85.

(84) A cat, weighing 6 lbs. 5 oz., received Strychnia Sulph. gr. 1-96. No result ensued, except slight increase of reflex excitability.

(85) The same animal, 20 days afterwards, weighing the same, received the same dose of Strychnia Sulph., together with Nicotin ♏ 1-50. The respiration immediately became difficult, then panting. 8 *min.*, twitching of ears. 9 *min.*, retching. 10 *min.*, the animal became convulsed, and in this condition leaped high in the air, then ran around the room, and at 11 *minutes* dropped dead.

Experiments 86, 87, 88.

(86) A cat, weighing 6½ lbs., received Strychnia Sulph. gr. 1-82. No symptoms ensued, except temporary stiffness in walking.

(87) The same animal, one week afterward, received Nicotin ♏1-30. The symptoms were: very difficult respiration; twitching of the ears; vomiting and purging; marked prostration. After 1½ hrs., the animal began to recover.

(88) The same animal, one week after the last experiment, received together Strychnia Sulph. gr. 1-82 and Nicotin ♏ 1-30. After 1 *min.*, difficult respiration, and twitching of the ears. 3 *min.*, violent vomiting, purging, and urination. The animal lay over on the side, breathing very noisily. 12 *min.*, tetanic convulsion, and death.

C. *On Rabbits.*

I. *Minimum Lethal Dose of Strychnia Sulph. on Rabbits.*

This has been determined by Bennett, as regards the pure alkaloid, to be 1-288 of a grain to the pound. Of course, the dose of the sulphate must be proportionally greater.

II. *Minimum Lethal Dose and Physiological effect of Nicotin on Rabbits.*

The minimum fatal dose was found to be about 1-80 of a minim to the pound, or 1-27 of a minim to a rabbit of average size (3 lbs.). The essential symptoms caused by Nicotin, as in the cases of cats and rats, are paralysis and convulsions, with profound disturbance of respiration. Vomiting does not occur; purging and urination are not as common symptoms as they are in the cat. Rabbits are generally killed by a single convulsion, whether caused by Nicotin or Strychnia.

TABLE VI.

Showing the Effects of Various Doses of Nicotin on Rabbits, and Indicating the Least Fatal Dose.

No.	Weight.	Dose of Nicotin in parts of a Minim.	Result.	SYMPTOMS.
89	3 lb. 4¼ oz.	1-60	Recovery.	After 10 *min.*, the animal was somewhat languid, and rested at full length. 1 *hour*, perfect recovery.
90	3 lb. 13 oz.	1-54	Recovery.	Temporary weakness. Contraction of the pupil.
91	3 lb. 2 oz.	1-50	Recovery.	After 10 *min*, languid. After 20 *min.*, dragged hinder legs somewhat when walking. After 30 *min.*, ceased to drag hinder legs, but walked as if they were somewhat stiff. Pupil contracted.
92	3 lb. 4¼ oz.	1-48	Recovery.	Temporary prostration, contraction of pupil.
93	3 lb. 1 oz.	1-45	Recovery.	After 3 *min.*, languid. The posterior extremities were dragged somewhat in walking, then were moved altogether, as if they were stiff. Pupils contracted. 15 *min.*, the animal moved around in a small circle. There were jerking movements of the body, which lasted a few seconds, and were succeeded by extreme prostration, without actual paralysis. After 45 *min.*, recovering.

TABLE VI.—CONTINUED.

No.	Weight.	Dose of Nicotin in parts of a Minim.	Result.	SYMPTOMS.
94	3 lb. 2 oz.	1-42	Recovery.	Temporary prostration and contraction of pupil.
95	3 lb. 4¼ oz.	1-30	Recovery.	After 7 *min.*, paralysis of hinder extremities, and shortly afterwards of anterior extremities. The paralysis continued until 30 *min.*, when if disturbed the animal could move a short distance, on her belly, all the limbs extended sideways. Rapid recovery ensued.
96	3 lb. 1 oz.	1-28	Recovery.	4 *min.*, she ran around the room, convulsed, screaming loudly and sharply. 4½ *min.*, rested quietly; panting respiration. 6 *min.*, ran around the room for ½ minute, convulsed, and screaming. After this, she became paralyzed, and lay stretched out on the belly. Respiration rapid and labored. This condition continued till 13 *min.*, when she had so far recovered, that when disturbed she moved herself on her belly along the floor for about two feet, using the limbs as lateral paddles. 50 *min.*, rapidly recovering.
97	3 lb. 1 oz.	1-27	Death	She walked across the room, wabbling, and placed her head in a corner. At 1 *min.*, she squealed sharply; the ears began to twitch. She fell on her side, and was seized with violent clonic convulsions, which lasted until 4 *min.*, when death ensued. The pupil at 2 *min.* had contracted from 7-20 to 2-20. As with all experiments with nicotin, the action of the heart continued after respiration had ceased.
98	3 lb. 2 oz.	1-20	Death.	After 1 *min.*, she lost all power over the hinder extremities, and, immediately after, over the front ones. 3 *min.*, severe convulsions occurred, after which she lay quiet and motionless. 5 *min.*, she was lifted, and had a slight convulsion. 10½ *min.*, convulsions occurred, and were succeeded by complete paralysis. The respiration grew slower and feebler, and, at 23 *min.*, ceased.
99	3lb. 13 oz.	1-14	Death.	1 *min.*, twitching of the ears, clonic convulsions. 3 *min.*, convulsions occurred, and were succeeded by paralysis of the entire body, excepting the head, since she moved the head and ears when the hind quarters were touched. 22 *min.*, convulsions set in violently, caused apparently by the irritation of a sudden noise. These continued at intervals until 31 *min.*, when one of them terminated in death. The respiration, from the beginning, was at times gasping, and at times comparatively easy.

III. *Effects of the Combined Action of Nicotin and Strychnia Sulphate on Rabbits.*

EXPERIMENTS 100, 101, 102.

(100) A rabbit, weighing 3 lbs. 4¼ oz., received Nicotin ℥ 1 50. Slight difficulty in walking, with prostration, and contraction of the pupil, ensued. In *one hour*, the animal had perfectly recovered.

(101) The same animal, 8 days after, received Strychnia Sulph. gr. 1-192. No result ensued.

(102) The same animal, 8 days after, received Strychnia Sulphate gr. 1-192, together with Nicotin ℳ1-50. The symptoms were the same as in Experiment 100.

Experiments 103, 104, 105.

(103) A rabbit, weighing 3 lbs. 5 oz., received Nicotin ℳ1-50, with the same result as in Experiment 100.

(104) The same animal, 8 days after, received Strychnia Sulph. gr. 1-128, with no effect.

(105) Eight days afterwards, the two doses were given together, with the same effect as when the Nicotin was given alone.

Experiments 106, 107, 108.

(106) A rabbit, weighing 3 lbs. 14½ oz., was given Nicotin ℳ1-50, with the same effect as in Experiment 100.

(107) The same animal, one week after, was given Strychnia Sulph. gr. 1-109, with no effect.

(108) After 8 days, the two doses were given together, and produced prostration, stiffness, noisy and labored respiration, with increase of reflex excitability.

Experiments 109, 110, 111.

(109) A rabbit, weighing 3 lbs. 14½ oz., received Strychnia Sulph. gr. 1-74. In 15 *min.* was accidentally struck by a door, and had a tetanic convulsion. 28 *min.* Perfect recovery.

(110) The same rabbit, 8 days afterwards, received Nicotin gr. 1-35. 3 *min.*, stiffness; difficult respiration. 15 *min.*, limbs almost completely paralyzed. 1½ *hour*, recovery.

(111) The same rabbit, after an interval of one week, received the two doses combined. After 2 *min.*, walked with difficulty; respiration labored. 10 *min.*, sat quiet, quivering occasionally. 35 *min.*, tetanic convulsion, and death.

Experiments 112, 113, 114.

(112) A rabbit, weighing 3 lbs. 11½ oz., received Strychnia Sulph. gr. 1-96, alone, and with no result.

(113) The same animal, 7 days afterwards, received Nicotin ℳ1-30. Marked prostration and difficulty in breathing resulted.

(114) After an interval of a week, the two doses were given combined. In addition to the symptoms mentioned under Experiment 113, a slight convulsion occurred.

Experiments 115, 116, 117.

(115) A rabbit, weighing 3 lbs. 11 oz., received Strychnia Sulph. gr. 1-82, with no result.

(116) The same animal received Nicotin ℳ1-30, with the same results as in Experiment 113.

(117) After one week, the two doses were given combined. 2 *min.*, dif-

ficult respiration; prostration. 8 *min.*, he lay with the extremities stretched out, powerless, his nose touching the ground. 1 *hour*, convulsive jerking. 70 *min.*, tetanic convulsion. 71 *min.*, brief clonic convulsion. Recovery.

Experiments 118, 119, 120.

(118) A rabbit, weighing 3 lbs. 11½ oz., received Strychnia Sulph. gr. 1-77, with no effect.

(119) The same animal, received Nicotin ℳ 1-30, with the same effect as in Experiment 113.

(120) One week after, the above-mentioned doses were given together to the same animal. For 22 *min.*, nothing was noted, except difficult locomotion, and prostration. Then two clonic convulsions occurred, in quick succession. 30 *min.*, clonic convulsion. 31 *min.*, tetanic convulsion, and death.

D. *On Dogs.*

Effects of the Combined Action of Nicotin and Strychnia Sulphate on Dogs.

Experiment 121.

A dog, weighing 2 lbs. 3 oz., received Strychnia Sulph. gr. 1-96. After 12 *min.*, the only symptom noticed was stiffness in walking. Nicotin ℳ 1-400 was now given; immediately, the stiffness of the extremities became so marked that it was almost impossible for the animal to walk. He lay down on his side, and, at 14 *min.*, had a violent clonic convulsion, lasting 1½ minute. At 15½ *min.*, Nicotin ℳ 1-400, was again injected. The animal continued to lay on the side powerless; the respiration became more and more feeble; there was convulsive twitching of the body: and death ensued, at 24 *min.*

Experiment 122.

A dog, weighing 4½ lbs., received Strychnia Sulph. gr. 1-72. 3 *min.*, no symptoms. Nicotin ℳ 1-400 was given. 6 *min.*, respiration labored, panting. 9 *min.*, he is very still; respiration the same. Nicotin ℳ 1-400 was again injected. 11 *min.*, irregular convulsions, during which Nicotin ℳ 1-400 was injected. The convulsion ceased at the 12*th min.*, but the animal still lay extended on the side, the respiration became less and less frequent, and ceased at the 14*th min.*

Experiment 123.

A dog, weighing 6½ lbs., received Strychnia Sulph. gr. 1-32. 6 *min.*, no symptoms. Nicotin ℳ 1-200 was now injected. The respiration immediately became somewhat labored. 13 *min.*, tetanic convulsion. Nicotin ℳ 1-200 injected. Immediately after the injection, a second tetanic convulsion occurred; shortly afterwards, a third. 16½ *min.*, death.

Experiment 124.

A dog, weighing 2½ lbs., received Strychnia Sulph. gr. 1-192, and Nicotin ℳ 1-96, by a single injection. 30 *seconds*, slow, panting respiration.

Pupils contracted; nictitating membrane drawn over the cornea. 35 *seconds*, he staggered a few steps, fell on the side, and in 1½ *min.* was seized with powerful tetanic convulsions, which terminated life at 4 *min.*

Experiment 125.

A dog, weighing 7 lbs., received Strychnia Sulph. gr. 1-32, with Nicotin ℳ1-200. 1 *min.*, labored respiration. 7 *min.*, slight convulsion. 7½ *min.*, Nicotin ℳ1-200 given. 8 *min.*, respiration labored and noisy. 9 *min.*, tetanic convulsion. 10 *min.*, Nicotin 1-200 given. 14 *min.*, tetanic convulsion, and death.

Experiments 126, 127, 128.

(126) A dog, weighing 2 lbs. 10 oz., received Strychnia Sulph. gr. 1-192. The symptoms were rigidity of the limbs, and slight increase of reflex excitability, lasting till the 25*th min.*

(127) The same animal, 5 days afterward, received Nicotin ℳ 1-192. The symptoms (which lasted about 20 minutes) were slow, labored respiration, staggering gait, vomiting, salivation, contracted pupil.

(128) The same animal, after 7 days, received the two drugs together, in the doses detailed above. The symptoms were slow, labored respiration, great weakness, staggering walk, vomiting, salivation, contraction of pupil; several slight convulsions between the 12th and 18th *mins.* 20 *min.*, recovery.

Experiments 129, 130, 131.

(129) A dog, weighing 7 lbs., received Strychnia Sulph. gr. 1-48. It was followed by stiffness and increased reflex excitability. When irritated, feeble convulsions occurred.

(130) The same animal, after 5 days, received Nicotin ℳ1-200. 2 *min.*, respiration very difficult; gait staggering. 7 *min.*, purging and vomiting.

(131) The same animal, 7 days afterwards, received the doses, detailed in Experiments 129 and 130, combined. 2 *min.*, difficult respiration, and staggering gait. 9 *min.*, vomiting; great rigidity. 12 to 20 *min.*, irregular convulsions occurred spontaneously; gradual recovery.

Experiments 132, 133, 134.

(132) A dog, weighing 5 lbs. 10 oz., received Strychnia Sulph. gr. 1-96. 15 *min.*, decided stiffness and difficulty in walking; somewhat labored respiration. 28 *min.*, recovering.

(133) The same animal, 6 days afterwards, received Nicotin ℳ1-200, with the same effect as in Experiment 130.

(134) The same animal, 7 days afterwards, received the two poisons combined in the doses detailed above. 1½ *min.*, difficult respiration. 7 *min.*, stiffness. 8 *min.*, vomiting; convulsive movements. 12 and 15 *min.*, irregular convulsions. 32 *min.*, recovering.

Experiments 135, 136, 137.

(135) A dog, weighing 2¾ lbs., received Strychnia Sulph. gr. 1-180, with the effects mentioned in Experiment 126.

(136) The same dog, 6 days afterwards, received Nicotin ℥1-192, with the effects described in Experiment 127.

(137) The same animal, 2 weeks afterwards, weighing then 4½ lbs., received the two poisons combined, in the doses mentioned in the two preceding experiments. 1 *min.*, panting respiration. 4 *min.*, lay quietly, as if exhausted. 12 *min.*, vomiting. 29 *min.*, decided rigidity. He stood with his head in a corner, moaning. Though the animal had much increased in weight, the symptoms were more marked than in the controlling experiments.

Experiments 138, 139, 140.

(138) A dog, weighing 11 lbs., received Strychnia Sulph. gr. 1-48, with no effect.

(139) The same animal, after 6 days, received Nicotin ℥1-20. 1 *min.*, difficult respiration. 2 *min.*, staggering gait. 15 *min.*, recovering.

(140) The same animal, 7 days after, received Nicotin ℥1-20. Immediately, the animal became almost completely paralyzed, and breathed noisily and laboriously. 1 *min.*, Strychnia Sulph gr. 1-96 was injected. Clonic convulsions set in after a few seconds, and continued for 1½ minute. During the convulsion, a second injection of Strychnia Sulph. gr. 1.96 (making in all gr. 1-48) was given. 2½ *min.*, convulsions ceased; temporary cessation of respiration, which recommenced with a gasp, and for 5 minutes was very laborious and infrequent (5 to 10 per minute). During this time, the animal remained completely paralyzed and unconscious. 7½ *min.*, he staggered across the room; respiration improving; pupil contracted, and nictitating membrane drawn. 21 *min.*, the animal now stood in a stiff, uneasy attitude, quivering very much when touched, and every minute running across the room, howling, slightly convulsed. 38 *min.*, he was lifted slightly with the foot, and fell over on his side in a violent clonic convulsion. After this, no more convulsions occurred. The animal gradually recovered.

Experiment 141, 142, 143.

(141) A dog, weighing 14 lbs., received Strychnia Sulph. gr. 1-24. It was followed by marked increase of reflex excitability, lasting 75 minutes. The animal barely escaped a convulsion.

(142) The same animal, one week after, received Nicotin ℥1-20, with the effects noted under Experiment 139.

(143) The same animal, one week after, received the two poisons combined, in the doses just detailed. 5 *min.*, difficult respiration, great rigidity, vomiting. 15 *min.*, severe clonic convulsions lasting two minutes. 23 to 35 *min.*, he had numerous convulsions, but none strong enough to cause him to fall. Then a powerful tetanic convulsion occurred; then the same condition of semi-convulsion was noted; and at 45 *min.*, another tetanic convulsion, and death.

Remarks.

The recorded cases of Strychnia poisoning treated by Tobacco are extremely unsatisfactory. If they prove anything, it is merely that Tobacco is a powerful emetic.

Haughton's experiments on this subject (really only two in number) were performed in such an unscientific manner as to be utterly valueless.

Wormley's and Reese's experiments would certainly seem conclusive, were it not for the fact that the drugs were administered by the mouth: therefore, since vomiting so generally occurred, we cannot feel certain that the tobacco infusion was absorbed with sufficient rapidity, or in sufficient quantity, to exert any possible antidotal power.

From the experiments given in detail in the preceding pages, the following inferences may, I think, safely be drawn:

1. Strychnia and Nicotin are in no degree antagonistic poisons.

2. Strychnia increases the convulsive action, and does not diminish the motor paralysis, of Nicotin.*

3. Nicotin (even in paralyzing doses) increases the convulsive action of Strychnia.†

4. Both poisons cause death by paralyzing the respiratory apparatus. They may effect respiration in different ways, but the result is the same.

5. Animals may be killed by injecting together doses of the two drugs, which, singly, are not fatal.‡

There is no reason to suppose that the above deductions are not applicable to the human animal. The symptoms of poisoning by the two drugs are identical in man and the lower animals. As regards Strychnia, this is too well known to need further remark. In regard to Nicotin, it is only necessary to refer the reader to the recorded cases of poisoning by that drug.§

It may not be out of place to mention the fact that experimentation has proven that Nicotin and Strychnia show a remarkable similarity in their intimate action on the nervous system, both being excitants of the spinal

* Exps. 25, 27, 28, 29, 30, 42, 43, 44, 45, 46, 88, 111, 131, etc.

† Exps. 81, 83, 85, 88, 114, 117, 128, 131, 140, 143, etc.

‡ Exps. 88, 111, 120, 143, etc.

§(1) A man, who had swallowed a mouthful of tobacco, became suddenly and completely *paralyzed; convulsions* set in; then *vomiting* and *purging;* and he finally died of exhaustion. (*Edin. Medical Journal*, Vol. I., p. 643.)

(2) A man received an enema of an infusion of two ounces of tobacco. In seven or eight minutes, he became pale and stupid; his speech was indistinct; and he complained of pains in the abdomen and head. There were *convulsive tremors*, first of the arms, then of the body. These symptoms were followed by *extreme prostration, and slow, laborious breathing;* then by coma, which terminated by death eighteen minutes after the poison had been injected. (*Tavignot, Gazette Med. de Paris*, Nov. 1840, p. 763.)

(3) Stillé gives the following symptoms in a case of poisoning by tobacco, in the person of a young woman: Slow respiration, coma, opisthotonos, with clonic convulsions of the extremities, dilated pupils. (*Therap. and Mat. Med.*, Vol. IV, p. 325.)

(4) A man sat over a chamber-pot containing some tobacco, on which hot

cord, and paralyzers of the motor or efferent nerves.* For the explanation of these assertions, and for many other deeply interesting facts connected with this subject, the reader is referred to other sources.

On the Brain of Coryphodon.

By E. D. Cope.

(*Read before the American Philosophical Society, March* 16, 1877.)

The character of the brain in *Coryphodon* being an important desideratum, I endeavored to obtain a cast of the cranial cavity of a well preserved skull of a *C. elephantopus*, from the Wasatch beds of New Mexico. The hard sandstone matrix which filled it, was removed with some difficulty; the more as its surfaces were indurated by a cement containing much iron oxide. The osseous walls were found in a good state of preservation. It was ascertained that there is a considerable *foramen lacerum posterius*, but which is not nearly of such proportionate size as that in the genus *Tapirus*.

The form of the brain-cast thus obtained is very remarkable. Its distinguishing peculiarities are, (1) the small size of the cerebellum; (2) the large size of the region of the corpora quadrigemina; (3) the small size of the hemispheres; and (4) the enormous size of the olfactory lobes.

There is in the cast a strong constriction in front of the *medulla oblongata* on one side, which does not exist on the other side. It is uncertain which represents the true form, as regards the lateral portion, but that there was a step-like constriction across the base of the brain at this point, there is no doubt. The medulla is very stout and wider than the hemispheres; it is depressed, and a protuberance on the inferior part of each side has the appearance of the base of the eighth pair of nerves. The region of the cerebellum is depressed and does not present in the cast a distinct line of demarkation from the medulla. An indication of the vermis is seen in a low longitudinal median protuberance. In front of this a transverse shallow depression separates it from the middle brain.

The region of the *corpora quadrigemina* is the most bulky portion of the

coals had been placed. After sitting a few minutes he became completely paralyzed, and showed no signs of life, except a deep sigh every fifteen or twenty seconds. (*London Med. Gaz.*, Oct. 1816, quoted by Stillé, *Op. Cit.* p. 321.)

(5) Taylor states that in a case of suicide by nicotin, that the person "became insensible and powerless within a few seconds, and died in from three to five minutes; without convulsions."

A reference to the experiments related in the text, will show the entire similarity of the action of tobacco on man, to its action on the lower animals.

*H. C. Wood's Therapeutics, pp. 284, 310, 311.